

THE CLAIMS

What is claimed is:

1. A method for concurrently producing at least a pair of semiconductor structures that each include at least one useful layer on a substrate comprising:
 - providing an initial structure that includes a useful layer having a front face on a support substrate;
 - 5 implanting atomic species into the useful layer to a controlled mean implantation depth to form a zone of weakness within the useful layer that defines first and second useful layers;
 - bonding a stiffening substrate to the front face of the initial structure;
 - and
 - 10 detaching the first useful layer from the second useful layer along the zone of weakness to obtain a pair of semiconductor structures with a first structure including the stiffening substrate and the first useful layer and a second structure including the support substrate and the second useful layer.
- 15 2. The method of claim 1 wherein the implanting includes introducing atomic species through the front face of the useful layer to form the zone of weakness.
3. The method of claim 1 wherein the useful layer is provided at a
20 sufficient thickness to provide multiple first and second useful layers during further processing.
4. The method of claim 3 which further comprises repeating the
25 implanting, bonding and detaching steps on the useful layers of the first and second structures to provide a third and fourth semiconductor structures, with the third structure including a second stiffening substrate and a third useful layer, and the fourth structure including a third stiffening substrate and a fourth useful layer.

5. The method of claim 4 wherein the first and second useful layers are provided at sufficient thicknesses to provide multiple third and fourth useful layers during further processing.

5 6. The method of claim 4 wherein the structures are suitable for use in electronic, optoelectronic or optic applications.

7. The method of claim 1 which further comprises at least one intermediate layer in the initial structure between the useful layer and the support
10 substrate.

8. The method of claim 7 wherein the intermediate layer is at least one of silicon dioxide (SiO_2), silicon nitride (Si_3N_4), a high permittivity insulating material, diamond or strained silicon.
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9. The method of claim 1 which further comprises providing an intermediate layer in the second structure between the stiffening substrate and the first useful layer.

20 10. The method of claim 9 wherein the intermediate layer is at least one of silicon dioxide (SiO_2), silicon nitride (Si_3N_4), a high permittivity insulating material, diamond or strained silicon.

11. The method of claim 1 wherein the bonding is achieved by molecular
25 adhesion.

12. The method of claim 1 wherein at least one of the support substrate, the stiffening substrate, or the useful layer is made of a semiconductor material.

30 13. The method of claim 1 wherein the support substrate includes at least one layer made of at least one of silicon, silicon carbide, sapphire, diamond, germanium, quartz, yttrium-stabilized zirconia or an alloy of silicon carbide.

14. The method of claim 1 wherein the stiffening substrate includes at least one layer made of at least one of silicon, silicon carbide, sapphire, diamond, germanium, quartz, yttrium-stabilized zirconia or an alloy of silicon carbide.

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15. The method claim 1 wherein the useful layer is made of at least one of silicon, silicon carbide, sapphire, diamond, germanium, silicon-germanium, a group III-V compound or a group II-VI compound.

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16. The method of claim 1 wherein the support substrate is made of a single-crystal or poly-crystal silicon, the useful layer is made of a single-crystal silicon, and the stiffening substrate is made of a single-crystal or poly-crystal silicon.